ABSTRACT

METHOD FOR REDUCING BIAS ERROR IN A VIBRATING STRUCTURE GYROSCOPE

A method for reducing bias error in a Vibrating Structure Gyroscope having a vibrating structure (1), primary drive means (2), for putting the vibrating structure (1) into carrier mode resonance, primary pick-off means (3) for sensing carrier mode motion, secondary pick-off means (10) for sensing response mode vibration of the vibrating structure (1) in response to applied rotation rate, secondary drive means (16) for applying a force to control the response mode motion closed loop primary control loops for maintaining a fixed amplitude of motion at the primary pick-off means (3) for maintaining the drive frequency at the resonance maximum, and secondary control loops for maintaining a null at the secondary pick-off means (10). In the method the ratio SF_{QUAD} over $SF_{IN\text{-}PHASE}$ is measured from the secondary control loop to provide a direct measurement of Sin $(\phi_{SD} + \phi_{PPO})$, according to the relationship $SF_{QUAD} = SF_{IN\text{-}PHASE} \times \text{Sin}\ (\phi_{SD} + \phi_{PPO})$ where SF_{QUAD} is the quadrature scalefactor $SF_{IN\text{-}PHASE}$ is the in-phase scalefactor, ϕ_{SD} is the phase error in the secondary drive means and ϕ_{PPO} is the phase error in the primary pick-off means. The total phase error ϕ_E is obtained directly from the measured Sin $(\phi_{SD} + \phi_{PPO})$ according to the relationship; $\phi_E = \phi_{SD} + \phi_{PPO}$ and phase corrections applied to the secondary drive means (16) and/or primary pick-off means (3) to reduce the phase error ϕ_E and hence the quadrature bias error to enhance the performance of the gyroscope.